Harnessing SNOMED: A Relational Database Design for the Computerized Patient Record (CPR)

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A CPR model that supports SNOMED cross-references was designed for a relational database query language. The model is compatible with a subsequent migration to an advanced object-oriented database design using predicate logic or a semantic network.

INTRODUCTION

Advanced CPR designs rely on knowledge-based and/or predicate-logic based vocabularies[1,2]. Complex data queries consequently need external programs overlying the database in order to manage the rules or the semantic links of the vocabulary[3]. While advanced knowledge-based CPRs uphold promises of exceptional designs, they remain complex for immediate practical use in many institutions. A strategy that could use state of the art technology and institutional skills and still exploit some of the advances of knowledge-based vocabularies would be more affordable for many institutions. The proposed model uses the native relational database query language in order to retrieve the full spectrum of clinical data. It relies on a simplification of the implicit predicate logic found in the cross-references of SNOMED.

METHODS

Simplifying hypotheses were developed to transform implicit SNOMED predicate logic-based concepts and their relation to other concepts in a form usable in a relational database.

Three important tables were involved in the design of the database. The description of the tables and their respective fields follows:

1. The **Clinical Data Table** (CDT) has been developed to support detailed medical observations such as symptoms, signs, diagnosis, etc.
   - The ***Clinical Data Field (CDF)*** contains the original wording.
   - The SNOMED Codes Field contains the most economical SNOMED encoding of the clinical data.
   - ***The First and Second Order SNOMED Cross-references Field (SCRF)*** consist of the cross-references associated with composite SNOMED concepts. Some of these cross-references have cross-references of their own. The fine grained explosion of a *composite* SNOMED concept ends with a string of *elementary* concepts.
   - A relationship to the Medical Observation Type Table (MOTT).
   - A relationship to the Patient-Physician Encounter Table (PPEI).
2. The **Medical Observation Type Table** (MOTT) relates 418 structural concepts of the clinical record to their SNOMED codes[4]. The CPR structure conveys essential concepts for the understanding and reuse of underlying clinical data[4].
3. The **Regular SNOMED Hierarchies Table** (RSHT). Extended SNOMED hierarchy codes have been adjusted for regular searches.

The implementation was done on ACCESS 2.0. SnoChk[5] succinct program was used independently on DOS.

RESULTS

Specific queries can be performed on the CDF field using succinct SNOMED encoding, and are comparable to any vocabulary query.

Sophisticated conceptual grouping can be done by propagating a query and its cross-references in the RSHT to determine the regular ranges. The ranges are then used to query every SRCF field its associated MOTT.

CONCLUSION

The proposed CPR model implements SNOMED on existing relational database environments without the need of a predicate logic analyser or of an associated semantic network. The use of strategic simplifying hypotheses exploits the advantages of SNOMED compositional concepts and their cross-references.

References

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2. Campbell KE, Das AK, Musen M. Logical Foundation for Representing of Clinical Data. JAMIA. 1994; 1:218-232.
3. Rector AL, et al. A Framework for Modelling the Electronic Medical Record. Meth Inf Med. 32(2): 109-19.
4. Lussier YL, Côté RA. A Comprehensive Analysis of SNOMED International Encoding of Symptoms, Signs and the the Patient Record Structure. AMIA 1995 Spring Congress. (selected for presentation).
5. Snochk has been developed by Medsight Informatique.

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